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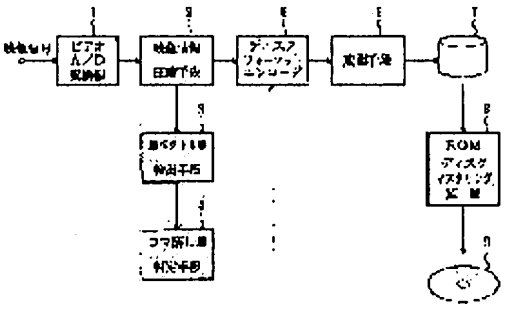
(54) VIDEO RECORDING AND REPRODUCING METHOD

(57)Abstract:

PURPOSE: To improve the file efficiency by setting optimizingly number of pictures per second corresponding to 7 moving speed of a pattern when a total amount of motion vectors is a prescribed level or below thereby reducing the number of pictures.

CONSTITUTION: A motion vector amount detection means 3 counts a motion vector amount per GOP of video information compressed by a video information compression means 2 and a de-framing amount discrimination means 4 decides number of de-frames per GOP depending whether or not the count exceeds a prescribed count. In this case, data of a B picture among compressed video data stored in a memory are eliminated at once by a disk format encoder 5 and header information to be allocated in the unit of one GOP or one picture is rewritten. In the case of a vector amount indicating a large motion, de- framing is reduced and in the case of a



vector amount indicating a small motion, de-framing is increased to reduce a data amount to be recorded on an optical disk. Since the de-framing amount is varied with the motion of the image in this way, de-framing is not conspicuous to eyes.

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* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While compressing digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record When the amount of motion vectors fluctuated according to a motion of the image for every frame contained in the above-mentioned compression image information is smaller than the absolute magnitude defined beforehand, reduce the number of coma per second and it records on a record medium. The image record playback approach of indicating the frame before and behind the frame which carried out [above-mentioned] the cutback by duplication, and having secured the predetermined number of need coma at the time of playback.
[Claim 2] While compressing digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record The amount of motion vectors fluctuated according to a motion of the image for every frame contained in the above-mentioned compression image information When smaller than the range inserted into the first absolute magnitude defined beforehand and the second absolute magnitude, the number of coma per second is reduced in proportion to the above-mentioned amount of motion vectors. It is the image record playback approach of reducing the number of coma per second, recording on a record medium so that it may be in inverse proportion to the amount of ****** BEKUCHITORU when larger than the above-mentioned range, indicating the frame before and behind the frame which carried out [above-mentioned] the cutback at the time of playback by duplication, and having secured the required number of coma.
[Claim 3] I picture whose image information recorded on the record medium is the image information which performs the inside DCT of a frame, P picture which is the image information by DCT coding which performs the motion compensation of front, It is continuation of the image information block of several frames in which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. The image record playback approach according to claim 1 or 2 characterized by deleting B picture of image data according to this amount of motion vectors while memorizing the amount of motion vectors per [above-mentioned] image information block.
[Claim 4] While compressing digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record The total amount of the amount of motion vectors changed according to the size of a motion of the image for every frame contained in the above-mentioned compression image information In are smaller than the first absolute magnitude defined beforehand and being larger than the second absolute magnitude which the variation for every screen of the amount of motion vectors defined beforehand, reduce the number of coma per second and it records on a record medium. The image record playback approach of indicating the frame before and behind the frame which carried out [above-mentioned] the cutback by duplication, and having secured the required number of coma at the time of playback.
[Claim 5] I picture whose image information recorded on the record medium is the image information which performs the inside DCT of a frame, P picture which is the image information by DCT coding

which performs the motion compensation of front, It is continuation of the image information block of the number with which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. While this amount of motion vectors is measured for every P picture of order while memorizing the amount of motion vectors per [above-mentioned] image information block, and detecting the amount of motion vector correlation in the above-mentioned image information block The image record playback approach according to claim 4 that the translation table which determines the number of coma omissions of the above-mentioned B picture determined the amount of coma omissions in the above-mentioned image information block based on the above-mentioned total amount and the above-mentioned amount of motion vector correlation.

[Claim 6] The amount of signs after encoding for every unit of the image information block which consists of two or more pictures at the time of the 1st encoding at the time of record, The amount of motion vectors of the image information block concerned is memorized. From this amount of signs and amount of motion vectors that were memorized the optimal amount of signs and the optimal number of coma for every above-mentioned image information-block unit for carrying out a predetermined time record to a record medium -- computing -- the time of the 2nd encoding -- the above -- the image record playback approach of above-mentioned having deleted B picture data several coma minutes while controlling to become the optimal amount of signs.

[Claim 7] I picture whose image information recorded on the record medium is the image information which performs the inside DCT of a frame, P picture which is the image information by DCT coding which performs the motion compensation of front, It is continuation of the image information block of several frames in which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. While memorizing the total amount of the amount of motion vectors per [above-mentioned] image information block The image record playback approach according to claim 6 that the translation table which determines the number of coma omissions of the above-mentioned B picture determined the amount of coma omissions in the above-mentioned image information block based on the above-mentioned total amount and the above-mentioned amount of motion vector correlation.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the high density record playback approach of an optical disk.
[0002]
[Description of the Prior Art] Drawing 15 is the block diagram of the conventional optical disk record regenerative apparatus shown in JP,4-114369,A. In order that the video A/D converter from which 1 changes a video signal into digital information, a frame sector conversion means to by_which 2 changes into sector information equal to the integral multiple of a frame period an image information-compression means and the image information into which 35 was compressed, and 36 may make an encoder and 37 may make the intersymbol interference in a record medium small, in drawing, a laser actuation circuit for the modulator for changing into a predetermined modulation code and 38 to modulate laser according to the above-mentioned modulation code and 39 are laser output switches.
[0003] As for the optical head to which 40 carries out an optical disk and 41 carries out outgoing radiation of the laser beam, the actuator which carries out the tracking of the light beam to which outgoing radiation of 42 is carried out from the optical head 41, the traverse motor by which 43 sends the optical head 41, the disk motor which 44 makes rotate a disk 40, and 47, a motorised circuit, and 45 and 46 are motor control circuits.
[0004] Moreover, the playback amplifier with which 48 amplifies the regenerative signal from the optical head 43, the demodulator which obtains the modulating signal with which 49 was recorded to data, an information expanding means by which a decoder and 51 elongate a frame sector inverse transformation means, and, as for 52, 50 elongates the above-mentioned condensed information, and 53 are D/A converters which change the elongated information into an analog video signal.
[0005] Drawing 16 is drawing which simplified and expressed the data array structure (layer structure) of an MPEG method where compress digital animation information, and normalization was advanced in order to accumulate, electrical transmission and. GOP which 54 becomes from two or more frame information, the GOP layer by which 55 is constituted from some pictures (screen), The slice whose 56 divided one screen into some blocks, the slice layer by which 57 is constituted from some macro blocks (MB), and 58 are block layers which consist of 8 pixel x8 pixels.
[0006] It is B picture to which DCT coding which I picture which drawing 17 is drawing having shown the coding structure when setting ten screens to 1GOP, and is the image information to which 61 carries out the inside DCT of a frame, P picture which is the image information by DCT coding whose 63 performs the motion compensation of front, and 62 used as the reference screen the above-mentioned I picture 61 and the P picture 63 which are located forward and backward in time, and performed the motion compensation is performed.
[0007] Drawing 18 (a) and (b) are drawings which compared what was made into the fixed rate, in order to make image transcription time amount regularity, when the image amount of data in 1GOP was made into adjustable structure, in order to make image quality between each GOP regularity. In drawing, 64 is

the disk most inner circumference and 65 is the disk outermost periphery.
[0008] Moreover, drawing 19 (a) is drawing having shown the amount of data per 1GOP at the time of keeping the image quality per 1GOP the same, alpha expresses the peak price of a data rate and beta expresses an average data rate. Moreover, drawing 19 (b) is drawing which measured the image quality and the amount of data per 1GOP in each image (e), (d), and (c).
[0009] Next, actuation of the conventional example is explained. It is possible by recording the above-mentioned condensed information on an optical disk to excel in retrieval nature compared with a tape medium which is represented by the conventional VTR etc., and to realize very user-friendly image filing equipment as the compression technology of digital image information progresses. Moreover, such disk file equipment does not have dubbing degradation compared with the case where an analog video signal is recorded in order to treat digital information, and since it is optical recording playback further, the system which was excellent in dependability non-contact is realizable.
[0010] When recording such compression animation information on an optical disk conventionally, the approach of recording digital compression animation information like the MPEG method shown in the optical disk 40 shown in the block circuit diagram of drawing 15 at drawing 16 is taken. At this time, the image information digitized with video A/D converter 1 is changed by standard compression animation methods, such as MPEG, by the image information-compression means 2. The modulation for making small effect of the intersymbol interference of an optical disk is performed, and this compressed image information is recorded on an optical disk 40 while it is encoded. It is in ** by making it the amount of data at this time, for example, each GOP unit, turn into the almost same amount, and distributing to a sector equal to the integral multiple of a frame period for edit in a GOP unit etc. to be attained.
[0011] Moreover, the image information recorded on the optical disk 40 at the time of playback is reproduced with the optical head 41, and it amplifies with the playback amplifier 48, and after restoring to digital data by the demodulator 49 and the decoder 50, it restores as pure image former data which removed data, such as the address and parity, with the frame sector inverse transformation means 51. Furthermore, it reappears to a video signal by performing for example, MPEG double sign-ization with the information expanding means 52, and it is changed into an analog video signal by D/A converter 53, and the display to a monitor etc. is attained with it.
[0012] If an MPEG method is used as the digital animation compression approach as mentioned above here, as shown in drawing 17 The I picture 61 which performs compression [/ in / DCT / a frame], and the P picture 63 which is the image information by DCT coding which performs the motion compensation of front, The B picture 62 to which DCT coding which performed the motion compensation by using as a reference screen the I picture 61 and the P picture 63 which are located forward and backward in time is performed will record some union ******** coding structures in an optical disk 40 as they are.
[0013] Although the I picture 61 can perform image reconstruction by this information independent among such information since it is performing the inside DCT of a frame Since the P picture 63 is performing the motion compensation of front, image reconstruction cannot be performed, if it is not after reproducing the I picture 61. Moreover, the B picture 62 Since it is a prediction screen from both directions, it is unreproducible, if it is not after reproducing the I picture 61 or the P picture 63 which is forward and backward. Moreover, the amount of data has few B pictures 62 which are naturally performing both-directions prediction among such information, and its coding effectiveness is good.
[0014] However, since this B picture 62 is independently unreproducible, the I picture 61 and the P picture 63 are needed, but if the number of sheets of that part and the B picture 62 is increased, while the amount of buffer memory in a processing circuit will increase, there is a problem on which the time delay from a data input to image reproduction increases. However, in the are recording system media represented by the optical disk etc., a good coding method of compression efficiency is desired for long duration record, and since the time delay of the above-mentioned image reproduction seldom becomes a problem on the other hand, the coding method as shown in drawing 16 - drawing 17 is suitable.
[0015] Next, in the optical disk of one sheet, if image data are recorded as becoming image quality regularity in every part, it will become adjustable rate structure as shown in drawing 18 (a). This is

because the image amount of data required for 1GOP is changed as shown in drawing 19 (a) when the image quality per 1GOP is set constant. this -- for example, it is because the compression efficiency in P picture or B picture does not become not much high when the amount of data which is needed for I picture in the case of a fine image increased, or when the early image data of a motion continue. Moreover, S/N of an image is also improved, although it is natural, and it differs depending on a pattern when the amount of data per 1GOP is made to increase as shown in drawing 19 (b).

[0016] On the other hand, in order to make regularity chart lasting time of one optical disk, the format recorded at the fixed rate shown in drawing 18 (b) is suitable. However, unlike a magnetic tape medium, in the case of the image record regenerative apparatus using an optical disk medium, since the total amount of data per one package is small, compression efficiency must be raised as much as possible, maintaining high definition. For that purpose, it cannot be overemphasized that the direction of the adjustable rate method shown in drawing 18 (a) has the good file effectiveness of the image data per optical disk.

[0017] Since it becomes possible to get to know all amounts-of-data distribution one optical disk at the time of an adjustable rate by encoding beforehand in the optical disk unit for example, only for playbacks there, it becomes possible to adjust the whole data distribution at the time of the 2nd encoding, and to adjust the playback time amount per disk uniformly as a result at the time of an adjustable rate.

[0018]

[Problem(s) to be Solved by the Invention] Although the file effectiveness of the image data recorded on the optical disk medium of one sheet by making the data rate per 1GOP adjustable in the image recording method of the conventional optical disk was raised as mentioned above, compared with the magnetic tape medium, the high file approach of compression efficiency was substantially desired further conventionally in the small optical disk medium of the total amount of data.

[0019] Moreover, also not only in the optical disk medium only for playbacks but in the optical disk medium which can be recorded on videotape, further, when insufficient for the remaining record area during record, a high file method of compression efficiency was desired rather than the usual compression method.

[0020] This invention was made for the purpose of canceling the above troubles, and aims at acquiring the image record playback approach that compression efficiency is high.

[0021]

[Means for Solving the Problem] While invention of claim 1 compresses digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record The amount of data of the motion vector data fluctuated according to a motion of the image for every frame contained in the above-mentioned compression image information In being smaller than the absolute magnitude which (it is hereafter called "the amount of motion vectors") defined beforehand, the number of coma per second is reduced and it records on a record medium, and the frame before and behind the frame which carried out [above-mentioned] the cutback at the time of playback is indicated by duplication, and the predetermined number of need coma is secured.

[0022] While invention of claim 2 compresses digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record The amount of motion vectors fluctuated according to a motion of the image for every frame contained in the above-mentioned compression image information When smaller than the range inserted into the first absolute magnitude defined beforehand and the second absolute magnitude, the number of coma per second is reduced in proportion to the above-mentioned amount of motion vectors. When larger than the above-mentioned range, the number of coma per second is reduced and it records on a record medium so that it may be in inverse proportion to the amount of ****** BEKUCHITORU, and the frame before and behind the frame which carried out [above-mentioned] the cutback at the time of playback is indicated by duplication, and the required number of coma is secured.

[0023] I picture whose invention of claim 3 is image information to which the image information recorded on the record medium in invention of claim 1 or claim 2 carries out the inside DCT of a frame,

P picture which is the image information by DCT coding which performs the motion compensation of front, It is continuation of the image information block of several frames in which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. While memorizing the amount of motion vectors per [above-mentioned] image information block, B picture of image data is deleted according to this amount of motion vectors.

[0024] While invention of claim 4 compresses digital image information based on the inter-frame motion presumption information which got mixed up in time at the time of record The total amount of the amount of motion vectors changed according to the size of a motion of the image for every frame contained in the above-mentioned compression image information In are smaller than the first absolute magnitude defined beforehand and being larger than the second absolute magnitude which the variation for every screen of the amount of motion vectors defined beforehand, reduce the number of coma per second and it records on a record medium. At the time of playback, the frame before and behind the frame which carried out [above-mentioned] the cutback is indicated by duplication, and the required number of coma is secured.

[0025] I picture whose invention of claim 5 is image information to which the image information recorded on the record medium in invention of claim 4 carries out the inside DCT of a frame, P picture which is the image information by DCT coding which performs the motion compensation of front, It is continuation of the image information block of the number with which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. While this amount of motion vectors is measured for every P picture of order while memorizing the amount of motion vectors per [above-mentioned] image information block, and detecting the amount of motion vector correlation in the above-mentioned image information block Based on the above-mentioned total amount and the above-mentioned amount of motion vector correlation, the translation table which determines the number of coma omissions of the above-mentioned B picture determines the amount of coma omissions in the above-mentioned image information block.

[0026] The amount of signs after encoding invention of claim 6 for every unit of the image information block which consists of two or more pictures at the time of the 1st encoding at the time of record, The amount of motion vectors of the image information block concerned is memorized. From this amount of signs and amount of motion vectors that were memorized the optimal amount of signs and the optimal number of coma for every above-mentioned image information-block unit for carrying out a predetermined time record to a record medium -- computing -- the time of the 2nd encoding -- the above -- while controlling to become the optimal amount of signs, B picture data is deleted [above-mentioned] several coma minutes.

[0027] I picture whose invention of claim 7 is image information to which the image information recorded on the record medium in invention of claim 6 carries out the inside DCT of a frame, P picture which is the image information by DCT coding which performs the motion compensation of front, It is continuation of the image information block of several frames in which B picture to which DCT coding which performed the motion compensation by using as a reference screen the above-mentioned I picture and P picture which are located forward and backward in time is performed is intermingled to dozens of frame unit. While memorizing the total amount of the amount of motion vectors per [above-mentioned] image information block, based on the above-mentioned total amount and the above-mentioned amount of motion vector correlation, the translation table which determines the number of coma omissions of the above-mentioned B picture determines the amount of coma omissions in the above-mentioned image information block.

[0028]

[Function] When the amount of motion vectors fluctuated according to a motion of the image for every frame is smaller than predetermined absolute magnitude according to invention of claim 1, while

reducing and recording the number of coma per second, the number of coma required for a display by indicating the frame before and behind the frame reduced at the time of playback by duplication is secured.

[0029] When the amount of motion vectors fluctuated according to a motion of the image for every frame is smaller than the predetermined range inserted into the absolute magnitude which is two according to invention of claim 2 While the number of coma per second is reduced in proportion to the above-mentioned amount of motion vectors, the number of coma per second is reduced in inverse proportion to the above-mentioned amount of motion vectors when larger than the above-mentioned predetermined range, and recording The number of coma required for a display by indicating the frame before and behind the frame reduced at the time of playback by duplication is secured.

[0030] According to invention of claim 3, while memorizing the amount of motion vectors of an image information-block unit, B picture of image data is deleted according to this amount of motion vectors.

[0031] According to invention of claim 4, the total amount of the amount of motion vectors which is contained in compression image information and changed according to the size of a motion of the image for every frame When the variation for every screen of the amount of motion vectors is larger than the second predetermined absolute magnitude, while reducing the number of coma per second smaller than the first predetermined absolute magnitude, the number of coma required for a display by indicating the frame before and behind the frame reduced at the time of playback by duplication is secured.

[0032] According to invention of claim 5, while memorizing the total amount of the amount of motion vectors of an image information-block unit, the amount of motion vectors is measured for every P picture of order, it is, and the amount of motion vector correlation in an account image information block is detected, based on the total amount of the above-mentioned amount of motion vectors, and the above-mentioned amount of motion vector correlation, the number of coma omissions of the above-mentioned B picture is determined, and the amount of coma omissions in the above-mentioned image information block is determined with a translation table.

[0033] While memorizing the amount of signs after encoding for every unit of the image information block which consists of two or more pictures at the time of the 1st encoding according to invention of claim 6 Memorize the amount of motion vectors of the above-mentioned image information block, and from the amount of signs and the amount of motion vectors which carried out [above-mentioned] storage the optimal amount of signs for predetermined carrying out a time record at the optical disk of one sheet, and the number of coma -- an image information-block unit -- computing -- the time of the 2nd encoding -- the above -- while controlling a quantization means to become the optimal amount of signs, B picture data is deleted several predetermined coma minutes.

[0034] According to invention of claim 7, while memorizing the total amount of the amount of motion vectors of an image information-block unit, the total amount of this amount of motion vectors is measured for every P picture of order, the amount of motion vector correlation in an image information block is detected, based on the total amount of the above-mentioned amount of motion vectors, and the above-mentioned amount of motion vector correlation, the number of coma omissions of the above-mentioned B picture is determined, and the amount of coma omissions in the above-mentioned image information block is determined with a translation table.

[0035]

[Example]

Example 1. drawing 1 is the block circuit diagram of the example 1 of this invention, and in case it creates the optical disk which recorded digital animation information on videotape, it raises the compression efficiency of a digital image by creating the record image file which reduced the number of coma per second of digital image information. For a disk-formatting encoder and 6, as for a record data file and 8, in drawing, a modulation means and 7 are [an amount detection means of motion vectors by which a video A/D converter and 2 detect an image information-compression means and, as for 3, 1 detects the amount of motion vectors, and 4 / the amount judging means of coma dropping and 5 / ROM disk mastering equipment and 9] creation ROM disks.

[0036] Drawing 2 is drawing having shown how it would perform coma dropping to the amount of

motion vectors in an example 1, and drawing 2 (a) shows the case where drawing 2 (b) changes 30 coma / second, 27 coma / second, and 24 coma / second for the case where 24 coma / second, and 30 coma / second are changed according to the amount of motion vectors, respectively.

[0037] Although the number of coma per second in TV screen changes also with the NTSC area or PAL areas, in the case of Japan or the U.S., they are 30 coma / second, for example. Although it is necessary to make the number of coma at the time of displaying on TV screen correspond to a format of TV method, the image data recorded on an optical disk can delete the data of a picture unit in the range which is not conspicuous even if it is necessary to not necessarily file no numbers of coma and carries out coma omission. In this case, in case a screen display is carried out, it can respond by setting the flag which repeats the last, same screen to a part for the header unit prepared in a part for the header unit prepared in the GOP unit which consists of two or more pictures, and the head part of picture data, and is reproduced to it.

[0038] However, it may be conspicuous to set aside, when it is the motion-picture film with which data consist of 24 coma / a second from the first, and to not necessarily make regularity the number of cutbacks of the picture in 1GOP unit depending on a pattern, when coma omission is carried out. So, in the example 1 shown in drawing 1 , it carries out adjustable [of the number which carries out coma omission according to the speed of a motion of a screen] accommodative.

[0039] Next, actuation of an example 1 is explained. The amount detection means of motion vectors extracts the amount of motion vectors of the image news compressed with the image information-compression means 2. Generally, since the small number of bits is assigned and the big number of bits is assigned to the direction with few motions in the larger one of a motion, the code of a motion vector only counts the amount of motion vectors, and can grasp the speed of the motion for every screen quantitatively.

[0040] Moreover, since it thinks also when some screens are large even when most screens are close to a static image, and moving depending on a pattern, in such a case, the direction which extracts the maximum of the motion vector data in a macro block (MB) unit instead of the average level of the whole picture, and makes it the amount of motion vectors is suitable.

[0041] Therefore, counting of the amount of motion vectors per 1GOP is carried out in the amount detector 3 of motion vectors, and it becomes possible by whether these enumerated data exceeded the predetermined value or it does not exceed to determine the number of coma omissions per 1GOP with the amount judging means 4 of coma dropping. Moreover, while deleting the data of B picture among the compression image data once stored in memory with the disk-formatting encoder 5 in this case, actuation which rewrites the header information currently assigned per 1GOP or the header information currently assigned per 1 picture is performed.

[0042] This is writing in the information on the picture which it becomes impossible to have decoded B picture which gets mixed up, and was deleted to the header, if I picture and P picture are deleted, and is because it becomes possible to make the screen of order freeze at the time of playback, and to double the number of coma per second with the required number of TV method.

[0043] In the case of an example 1, when the amount of motion vectors is large, it is lessening coma omission, for example, enlarging coma omission, when it is close to a static image and the amount of motion vectors is small, and it becomes possible to reduce the amount of data recorded on an optical disk. Even if it carries out coma omission, it stops being conspicuous to human being's eyes by such method, since adjustable [of the amount of coma omissions] is carried out according to a motion of a screen. Although it is desirable to carry out from P picture currently uniformly assigned in 1GOP as for detection of the amount of motion vectors in this case and it is possible also from B picture, there is a possibility that existence of the continuity of a compression image and both-directions data may complicate a system.

[0044] Moreover, it is also possible to also set the number of coma omissions as two kinds of six coma (number of pictures 24 coma / second) per second with zero according to the size of the amount of motion vectors in the amount judging means 4 of coma dropping, as shown in drawing 2 (a), and to set between six coma as a multistage story per second from zero, as it is shown in drawing 2 (b), although it

is possible. Since 24 coma / second has come in the case of the film film etc., also in specification, such as MPEG, the playback system from 24 coma / second etc. is specified. Therefore, if two steps of above-mentioned 24 coma / second, and a 30 coma / second prescribe coma omission especially, the structure of a system becomes easy and is very practical.

[0045] In the example 1, although the number of coma omissions is gradually determined in inverse proportion to the motion between pictures, when the property of actual human being's eyes was taken into consideration and the range which is example 2. and where a motion is too quick and can follow human being's eyes is exceeded, even if it enlarges the number of coma omissions, it may not be conversely conspicuous. It is because it is expected that this has the detection limit property of coma omission as shown in drawing 6 in human being's eyes. In this case, though natural, with the image near a static image, coma omission is hard to be detected. It is because coma omission is hard to be detected on the other hand though natural [a motion of an image is too intense, and] when flattery of human being's eyes is difficult. The example 2 of this invention amends the extract value of the amount of motion vectors using such a property.

[0046] Drawing 3 is the block circuit diagram of an example 2, the same sign as drawing 1 shows the same part, respectively, and 10 is a data-conversion table. When the amount of motion vectors is below predetermined absolute magnitude, this example 2 performs a number in inverse proportion to the amount of motion vectors of coma omissions, and is made to perform a number of coma omissions which were proportional at the above-mentioned amount of motion vectors in more than the above-mentioned absolute magnitude.

[0047] Drawing having shown the array of the digital compression image data with which drawing 4 is recorded on a disk before coma dropping in an example 2, The image information data which drawing 5 dropped the number of coma and were recorded on the optical disk are drawing having shown what the display on a screen would be at the time of playback. The display screen of the image data which have not carried out coma dropping of drawing 5 (a), the display screen of the image data with which drawing 5 (b) performed 1 screen coma dropping on three screens, The display screen of the image data with which drawing 5 (c) performed 2 screen coma dropping on three screens, and drawing 5 (d) show the display screen of the image data which performed 1 screen coma dropping on five screens, respectively.

[0048] Drawing 6 shows to how much it is drawing showing human being's feeling property of **, and the number of coma omissions detected to the earliness of a motion of an image is. Moreover, drawing 7 is drawing having shown an example about what coma drop [it] it performs according to the amount of motion vectors in an example 2.

[0049] In the example 2, while the amount of motion vectors determines the number of coma omissions in inverse proportion to the amount of motion vectors before a certain predetermined absolute magnitude, above the above-mentioned absolute magnitude, it is enabled to carry out coma omission in proportion to the amount of motion vectors. Coma dropping processing of compression image data completes other actuation by rewriting header information while it is the same as an example 1 and deletes B picture.

[0050] Thus, by the method of an example 2, since coma dropping becomes possible even when a motion is too quick compared with the method of an example 1 and human being's eyes do not catch up, the compression efficiency of the image data recorded on an optical disk becomes higher.

[0051] Moreover, even if it does not mind the above-mentioned translation table 10, making it a form as shown in drawing 7 can also realize the property of the amount judging means 4 of coma dropping. In this case, the allowed value of the number of coma dropping to a motion of a screen serves as a nonlinear property. Moreover, even when a motion is too intense to detect the amount of motion vectors, a certain amount of coma omission is permitted. Moreover, when close to a static image, it is possible to enlarge the number of coma omissions.

[0052] The image information actually recorded on an optical disk serves as a form as shown in drawing 4 (c). Digital compression image data from the first take a data array as shown in drawing 4 (a). Although this of I picture is possible for playback of original **, it is because P picture needs the prediction screen from front I picture or front P picture in time and B picture needs the prediction screen

from I picture or P picture of order. Therefore, unlike the playback sequence of a screen, it has composition which arranges the data of P picture to the degree of I picture, and arranges the data of B picture to the degree.

[0053] However, considering the case where only I picture and P picture are reproduced for example, at the time of special playback, it is very convenient that I picture and P picture are arranged continuously, and the data arrangement on an optical disk is rearranged like drawing 4 (c). Since the amount of data after compression is sufficiently small compared with the original video-signal amount of data, rearrangement of the memory of an optical disk regenerative apparatus is easily possible for this, and it is because it can fully respond to array conversion of the data mentioned above. In the case of this method, by deleting B picture selectively, when it is GOP which image data with a still quicker motion follow, as shown in drawing 4 (c), the amount of data is reduced more, and file effectiveness is improving.

[0054] Although the cutback of such data list substitutes and picture data is performed by the disk-formatting encoder 5 shown in drawing 1 or drawing 3 , modulations, such as eight-to-fourteen modulation and one to 7 modulation, are performed for the purpose of clearance of the intersymbol interference at the time of performing high density record further etc., and it is once recorded on recordable file equipments (for example, a magnetic disk, a magnetic tape or a magneto-optic disk, etc.). Thus, original recording is created with ROM disk mastering equipment 8 by the once kept data, and ROM disk 9 is mass-produced by La Stampa. Although it is natural, when an optical disk is a record regenerative apparatus, the above actuation is performed without minding the record data file 7 and ROM disk mastering equipment, and data are recorded on a direct optical disk.

[0055] Next, when the compression image data mentioned above are read from an optical disk, it reproduces and it displays on a screen, it comes to be shown in drawing 5 . Drawing 5 (a) corresponds per the image before encoding, and picture by the case where it is the image which does not permit coma dropping and which has a motion to some extent between pictures. On the other hand, when the coma omission of one screen is permitted on three screens, it becomes like drawing 5 (b), the coma omission of B-2, B4, and the B6 picture is carried out, and B1, B3, and B5 picture are made to freeze respectively (it displays repeatedly once again). Furthermore, when 2 screen coma omission is permitted on three screens, a screen without B picture is reproduced. Case [like drawing 5 (c)], in human being's eyes, the condition of coma omission has become is easy to be detected, but when very close to a static image, it is not conspicuous even if it permits coma omission so far.

[0056] Moreover, it thinks, also when it permits coma dropping one coma every 5 which are the medium of drawing 5 (a) and drawing 5 (b) screens, as shown in drawing 5 (d), and the coma omission of the B picture is carried out even in this case, and it can respond by freezing the picture of order. In order to perform that only B picture drops [coma], fixing [in order in the case of drawing 5 (d) it is not conspicuous to human being's eyes to make the location of a frieze in five screens fix and to carry out, it is desirable and] a frieze location, as the unit in this case which carries out coma omission shows drawing 5 (d), not only making a front image not necessarily freeze but the frieze from a next image is performed. Control of such a frieze is performed by forming a flag etc. in the header unit prepared in the head part in the header unit or picture data prepared in the head of GOP.

[0057] Example 3. drawing 8 is the block circuit diagram of the example 3 of this invention, and the same sign as drawing 3 shows the same part, respectively. A subtractor for the memory 11 remembers the amount of motion vectors for one screen to be, and 12 to subtract the amount of motion vectors in front of current motion vector data and 1 screen, An absolute value detector for 13 to take the absolute value of a subtractor 11 and 18 are the amount decision tables of coma omissions for determining the number of coma omissions from the motion vector converted quantity detector 4 and the absolute value detector 13.

[0058] As for the image with which drawing 9 was property drawing having shown the detection limit (is coma omission conspicuous or not?) of the eye of the man of coma omission to the amount of motion vector correlation equivalent to the smoothness of the motion for every picture, and the motion was awkward although it was natural, coma omission is not conspicuous. On the other hand, by the image

(what has a motion of an image close to constant speed) which is represented by a pan, a zoom, etc. at the time of photography, for example and which moves smoothly, coma omission tends to be conspicuous. When current changes PAL which is TV method of Europe into NTSC which is TV method of the Japanese U.S., a frieze of coma dropping by TV format conversion adjustment or a screen tends to be conspicuous at the time of a pan and a zoom. Moreover, even when changing into an NTSC format from a motion-picture film, the slight frieze in a smooth motion may be conspicuous.

[0059] An example 3 is the data file method of the optical disk using the property of this drawing 9 , and in order to detect the amount of motion vector correlation corresponding to the smoothness of a motion of a screen While taking the difference of the amount of motion vectors for one screen which memory 11 was made to memorize, and the current amount of motion vectors with a subtractor 12 taking that absolute value in the absolute value detector 13 -- the amount of motion vector correlation -- detecting -- this amount of motion vector correlation -- a basis -- the amount decision table 18 of ****** coma omissions has determined the number of coma omissions.

[0060] Moreover, although two, the amount of correlation of a motion vector and absolute magnitude, become a parameter for carrying out coma omission in the system of an example 3, a response becomes possible by setting up the coma dropping decision table 18 like drawing 10 . This drawing 10 is what used four steps of the amounts of coma omissions to d-a corresponding to the amount of motion vectors, and the amount of motion vector correlation, and when such a table is used, the absolute magnitude of a motion vector is received. It is possible to give the linearity property of permitting coma omission, to the amount of motion vector correlation to carrying out the nonlinear property that coma omission is permitted, when correlation is weak even if too large and too few, and to make a decision complicated as a whole make.

[0061] Moreover, as shown in drawing 11 , when coma omission is made to perform only from two kinds, the video data of 30 coma / second, and the video data of 24 coma / second, and correlation is very weak, it considers as 24 coma / second immobilization, when correlation is strong, it considers as 30 coma / second immobilization, and only when the amount of correlation is whenever [middle], the method which is made to correspond to the motion vector amount of data, and is changed can be considered.

[0062] Example 4. drawing 12 is the block circuit diagram of the example 4 of this invention, the same sign as drawing 1 shows the same part, respectively, and, as for memory and 16, 15 is [the amount detection means of motion vectors in 1GOP and 17] the amount detection means of motion vector correlation.

[0063] It detected the amount of motion vector correlation before and behind the picture in 1GOP with the amount detection means 17 of motion vector correlation, and has determined the amount of coma omissions in 1GOP on the amount decision table 18 of coma omissions based on these two information while it detects the absolute magnitude of a motion with the amount detection means 16 of motion vectors in 1GOP, once this example 4 records image data on memory 15.

[0064] This example 4 is what used not only the amount of motion vectors like an example 1 - an example 3 but the animation information itself. As shown in drawing 12 , while detecting the amount of motion vectors of a picture unit by taking a difference with the data in front of 1 picture using the memory 15 which makes image data memorize Detect the amount of motion vector correlation (is a motion smooth or is awkward or not?) by comparing with the difference information in front of [of the above] one the difference information which took the difference for every picture, and this by totaling per 1GOP with the detection means 16 and 17 It considers as the input of the amount decision table 18 of coma omissions.

[0065] According to this example 4, even if it does not detect the amount of motion vectors, it becomes possible to make the number of coma omissions judge only by memorizing direct image data.

[0066] Example 5. drawing 13 is the block circuit diagram of the example 5 of this invention, and the same sign as drawing 11 shows the same part, respectively. In 19, a motion compensation prediction machine and 20 a quantizer and 22 for a DCT encoder and 21 A variable-length encoder, The amount counter of signs with which 23 counts the amount of signs per 1GOP, the amount memory of signs 24

remembers the amount counted value of signs to be, A GOP rate setter for 25 to set up an ideal GOP rate from the output of the amount memory of signs, The amount allocation machine of signs which 26 assigns the amount of signs based on the output from the GOP rate setter 25, A switch for a subtractor for 27 to take the difference of the current amount of signs and the ideal amount of signs and 28 to divide temporary coding and this coding and 34 are these several percent coma machines that memorize the ideal number of coma from the amount decision table 18 of coma omissions.

[0067] In order to make file effectiveness raise further, this example 5 making image quality on a disk homogeneity, it is filed in a disk with an adjustable rate, without considering the data rate per 1GOP as shown in drawing 13 as immobilization.

[0068] Generally, as the image compression method represented by MPEG etc. is shown in drawing 13 , it consists of a motion compensation prediction machine 19 using the prediction image from I picture of before or order, or P picture as a reference screen, and the quantizer 21 and the variable-length encoder 22 for adjusting the DCT encoder 20 and the amount of signs, image quality is fixed first, a switch 28 is pushed down, and 1st temporary coding is performed. Furthermore, the amount of signs per 1GOP at the time of the above-mentioned temporary coding is counted with the amount counter 23 of signs, and the amount of signs equivalent to one disk is memorized in the amount memory 24 of signs. Moreover, from the amount of signs for one disk memorized in the above-mentioned amount memory 24 of signs, in the GOP rate setting out 25, it resets up so that it may become the ideal amount of signs in consideration of the total data storage capacity of an entire disk, and a target rate is stored in the amount allocation machine 26 of signs.

[0069] Next, while pushing down a switch 28 in the direction of [at the time of this coding], the 2nd encoding actuation is made to perform. At this time, it sets to a quantizer 21, feedback control is applied so that the output of the amount allocation machine 26 of signs and the output of the amount counter 23 of signs in the variable-length encoder 22 at the time of the second encoding may be in agreement, and it is controlled mostly in agreement with the ideal amount of signs which this memorized in the amount allocation vessel 26 of signs at the time of the 1st encoding. Moreover, simultaneously, in the case of the 1st above-mentioned encoding actuation, the detection means 16 and 17 detect the amount of motion vectors and the amount of motion vector correlation in 1GOP, the amount decision table 18 of coma omissions is made to determine the amount of coma omissions, and it memorizes in this several percent coma vessel 34. Actual coma dropping actuation is performed by adding the frieze information on the screen which is needed at the time of playback to a part for a header unit while deleting B picture data with the disk-formatting encoder 5 at the time of this 2nd coding.

[0070] In order to make this coding of the 2nd allocation perform the ideal number of coma per 1GOP at the same time it assigns the amount of ideal signs at the time of fixing image quality of each GOP unit in the system of an example 5 as mentioned above, and making it an adjustable rate, it becomes possible to raise file effectiveness more. In the field part of the former image from which compressibility is not especially gathered in image quality, it became possible to assign many numbers of bits, and high definition-ization of it was attained only from the part which permitted coma omission.

[0071] Example 6. drawing 14 is the block circuit diagram of the example 6 of this invention, the same sign as drawing 13 shows the same part, respectively, and the subtractor with which a frame memory, and 30 and 31 constitute a quantizer and, as for 32, 29 constitutes a differential element, and 33 are subtractors which constitute an addition element.

[0072] As a frame memory 29 is made to memorize the amount of motion vectors for one frame, motion vector absolute magnitude and the amount of motion vector correlation are detected, the amount decision table 18 of coma omissions determines the number of coma omissions using this amount of motion vectors and this several percent coma machine 34 is made to memorize, an adjustable data rate and coma omission are permitted.

[0073] This example 6 is constituted so that the number of coma other than the approach using a motion vector like an example 5 may be determined from the output of video A/D converter 1. Even if it sets this example 6, about the point that feedback control is performed so that it may become the ideal amount of signs memorized by the amount allocation machine 26 of signs, it is the same as the case of

an example 5 by making the 1st encoding actuation and the 2nd encoding actuation perform. However, in the case of an example 6, while making the direct frame memory 29 memorize the output of video A/D converter 1 By taking further the output of the subtractor 32 which detects the amount of motions for every picture by taking the difference of the picture of order with a subtractor 32, memorizes the signal after the above-mentioned subtraction to a frame memory 29 once again, and gets mixed up in time with another subtractor 33 The correlation value (smoothness) of a motion is detected and the amount decision table 18 of coma omissions determines the amount of coma omissions.

[0074] Thus, while the obtained several percent coma equivalent is memorized by this several percent coma machine 34, in the disk-formatting encoder 5, deletion of B picture etc. is performed at the time of this coding. Thus, in the case of the example 6, the same effectiveness as the case of an example 5 was acquired, in the field part of the former image from which compressibility is not gathered in image quality, it became possible to assign many numbers of bits, and high definition-ization of it was attained only from the part which permitted coma omission.

[0075]

[Effect of the Invention] When the total amount of a motion vector is below fixed level, in order to make the number of pictures reduce according to invention of claim 1, according to the speed of a motion of a screen, the optimal setting out of the number of pictures per second is attained, and the file effectiveness to the optical disk of a digital compression animation signal using a motion compensation improves by the above-mentioned number cutback of pictures.

[0076] Since coma omission was permitted more than the 2nd level with the bigger set point than the 1st level else [in below the fixed level which the total amount of a motion vector showed by invention of claim 1] according to invention of claim 2, The speed of a motion of a picture unit becomes reducible [the number of coma] also in the image in which the motion which cannot follow human being's eyes is shown greatly, and the file effectiveness to an optical disk improves further.

[0077] Since the digital compression image is divided into the image which performs the inside DCT of the frame which exists selectively, and the image accompanied by the other motion compensation prediction according to invention of claim 3, The special playback using the image in [DCT] a frame is attained, and also high compression rate-ization by the motion compensation prediction image is attained. Furthermore, since it limited to B picture to be predicted from the picture which gets mixed up among the images accompanied by the above-mentioned motion compensation prediction and permitted coma dropping, prediction disabling of a picture before and after basing on coma dropping could be avoided.

[0078] Since according to invention of claim 4 not only the absolute magnitude of the speed of the motion for every picture but the fixed degree (smoothness) of a motion is taken into consideration and the number of coma omissions can be determined, Since coma omission was permitted in the image accompanied by the motion which prevention of was attained and was awkward in making impossible coma omission perform to the case where coma omission tends to be conspicuous in order that a motion may move smoothly at least to some extent, file effectiveness improves further.

[0079] The image which performs the inside DCT of the frame in which a digital compression image exists selectively according to invention of claim 5, By using P picture which has been divided into the image accompanied by the other motion compensation prediction, exists periodically among the images accompanied by the above-mentioned motion compensation prediction, and uses the prediction screen from one direction Since it became possible to extract the absolute magnitude and smoothness of the amount of motion vectors with a sufficient precision, and it limited to B picture to be predicted from the picture which gets mixed up and coma omission was permitted, prediction disabling of a picture before and after basing on coma omission could be avoided.

[0080] Since according to invention of claim 6 it was made to realize the compression image bit stream so that encoding actuation at the time of a disk fabrication might be performed twice, the amount of optimum codes and the number of optimal coma in each GOP unit might be first set up by the 1st time and it might become the above-mentioned optimum value in the 2nd encoding actuation, not only the amount of signs but the number of coma is made adjustable, and improves file effectiveness by leaps

and bounds.

[0081] The image which performs the inside DCT of the frame in which a digital compression image exists selectively according to invention of claim 7, By using P picture which has been divided into the image accompanied by the other motion compensation prediction, exists periodically among the images accompanied by the above-mentioned motion compensation prediction, and uses the prediction screen from one direction Since it became possible to extract the absolute magnitude and smoothness of a motion with a sufficient precision, and it limited to B picture to be predicted from the picture which gets mixed up and coma omission was permitted, prediction disabling of a picture before and after basing on coma omission could be avoided.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block circuit diagram of the example 1 of this invention.
[Drawing 2] It is drawing showing the number of coma omissions to the amount of motion vectors of an example 1.
[Drawing 3] It is the block circuit diagram of the example 2 of this invention.
[Drawing 4] It is drawing showing the bit stream structure of an example 2.
[Drawing 5] It is drawing showing the image reproduction screen of an example 2.
[Drawing 6] It is property drawing showing the detection limit of the coma omission to the speed of a motion.
[Drawing 7] It is drawing showing the number of coma omissions to the amount of motion vectors of an example 2.
[Drawing 8] It is the block circuit diagram of the example 3 of this invention.
[Drawing 9] It is property drawing showing the detection limit of the coma omission to the smoothness of a motion.
[Drawing 10] It is drawing showing one example of the amount decision table of coma omissions of an example 3.
[Drawing 11] It is drawing showing other examples of the amount decision table of coma omissions of an example 3.
[Drawing 12] It is the block circuit diagram of the example 4 of this invention.
[Drawing 13] It is the block circuit diagram of the example 5 of this invention.
[Drawing 14] It is the block circuit diagram of the example 6 of this invention.
[Drawing 15] It is the block circuit diagram of the conventional optical disk record regenerative apparatus.
[Drawing 16] It is drawing showing the picture structure of digital animation image information.
[Drawing 17] It is drawing showing the picture structure of digital animation image information.
[Drawing 18] It is drawing showing the picture structure of digital animation image information.
[Drawing 19] It is drawing showing the amount of data at the time of an adjustable rate.
[Description of Notations]
1 Video A/D Converter, 2 Image Information-Compression Means, 3 The Amount Detection Means of Motion Vectors, 4 The amount judging means of coma dropping, 5 Disk-formatting encoder, 6 A modulation means, 7 A record data file, 8 ROM disk mastering equipment, 9 A creation ROM disk, 10 11 A data-conversion table, 15 Memory, 12, 27, 32, 33 A subtractor, 13 An absolute value detector, 14 Motion vector converted quantity detector, 16 The amount detection means of motion vectors, 17 The amount detection means of motion vector correlation, 18 The amount decision table of coma omissions, 19 A motion compensation prediction machine, 20 DCT encoder, 21, 30, 31, a quantizer, 22 A variable-length encoder, 23 The amount counter of signs, 24 The amount memory of signs, 25 A GOP rate setter, 26 The amount allocation machine of signs, 28 A switch, 29 A frame memory, 34 This several percent coma machine,

* NOTICES *

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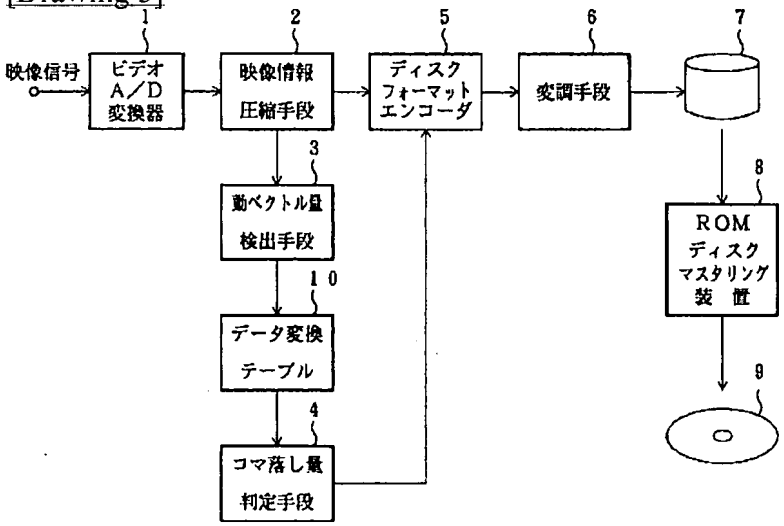
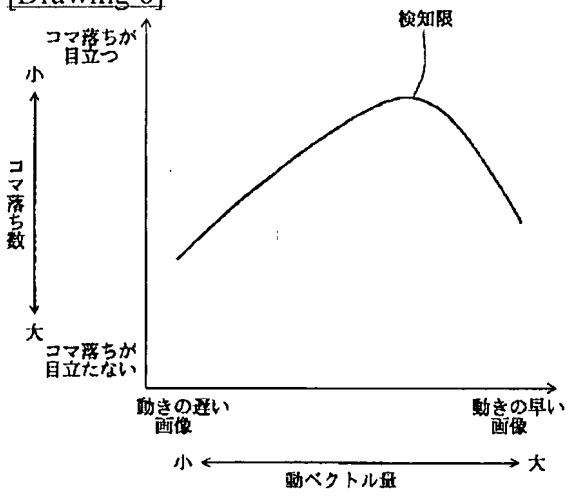
3.In the drawings, any words are not translated.

DRAWINGS

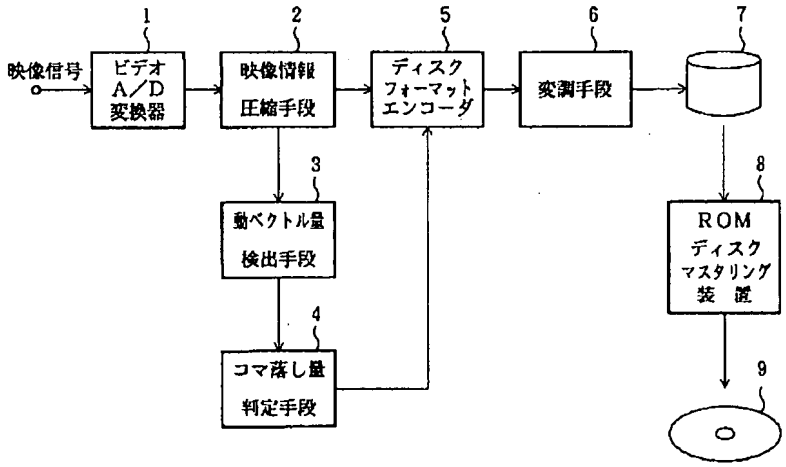
[Drawing 3]



[Drawing 6]



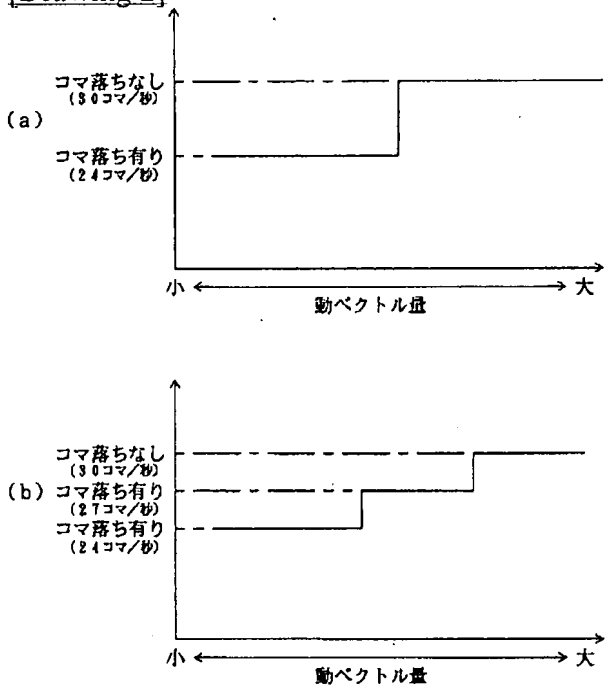
[Drawing 1]



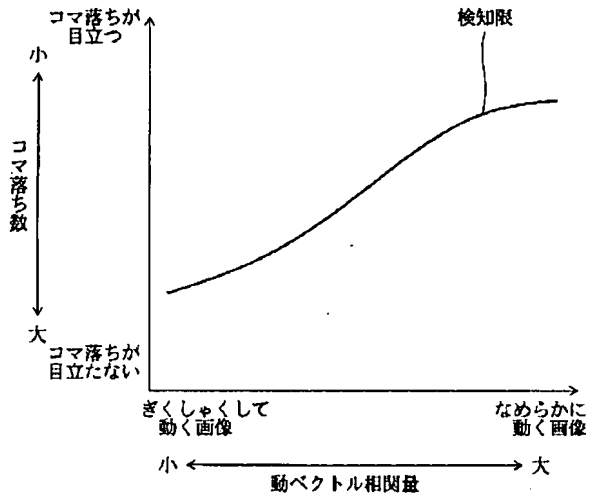
7 記録データファイル

9 作成ROMディスク

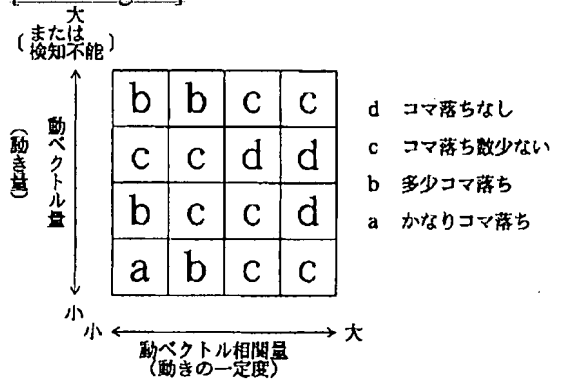
[Drawing 2]



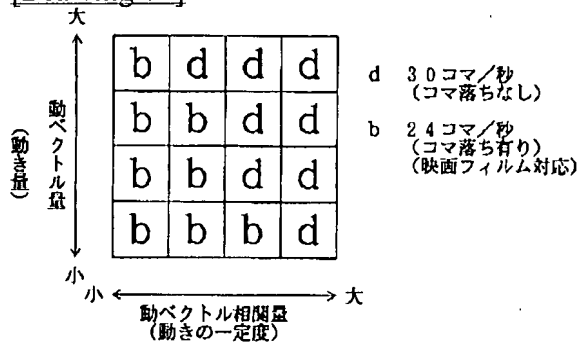
[Drawing 9]



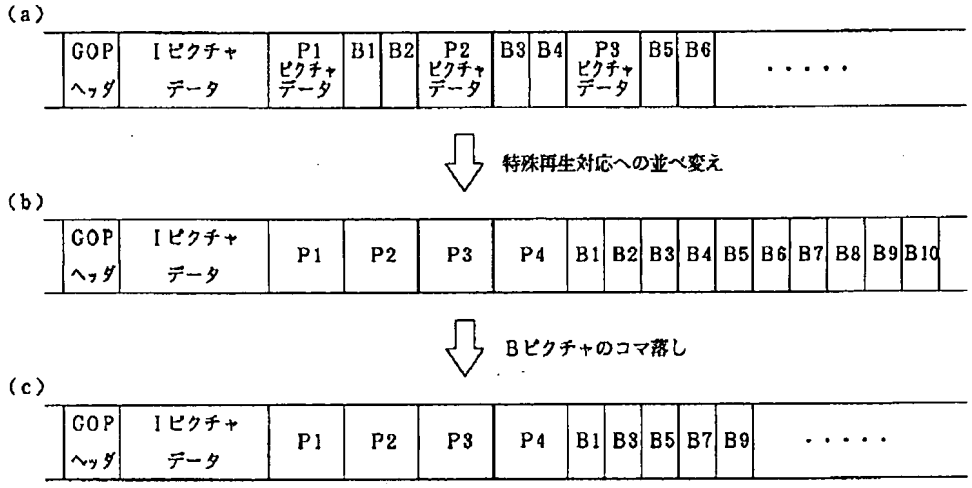
[Drawing 10]



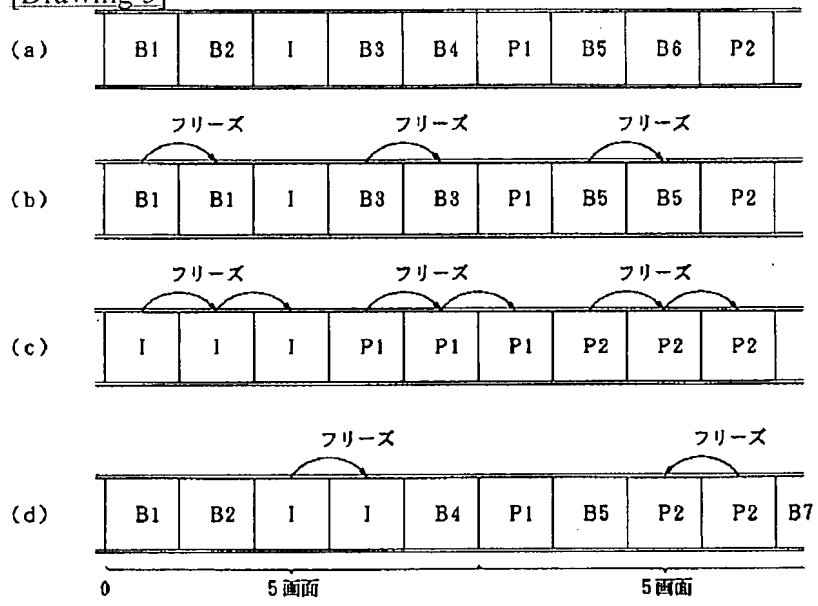
[Drawing 11]



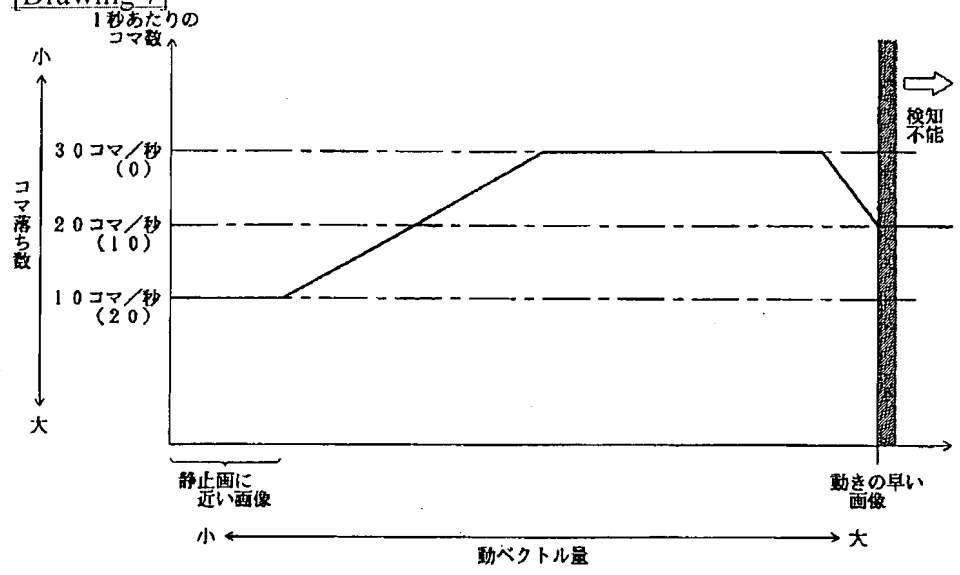
[Drawing 4]



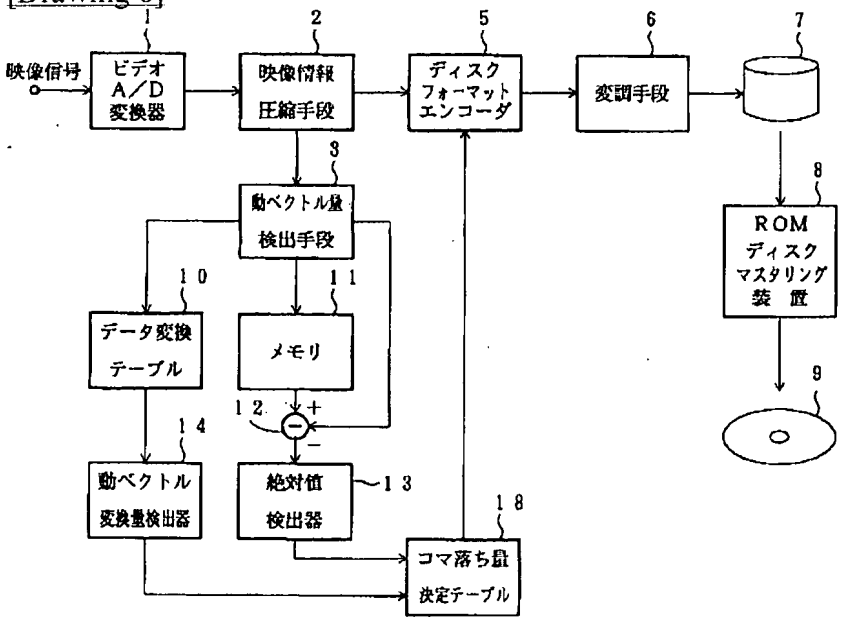
[Drawing 5]



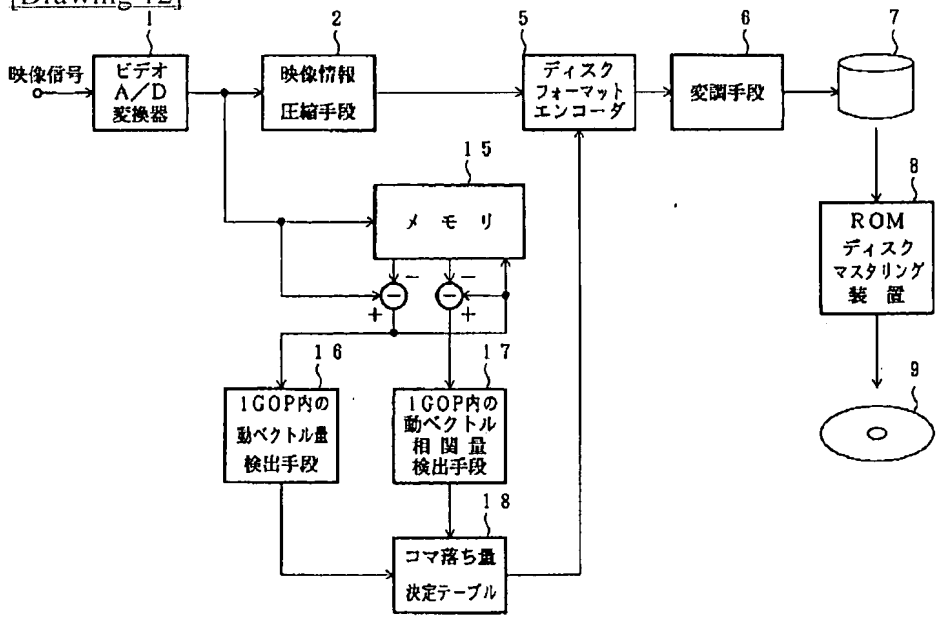
[Drawing 7]



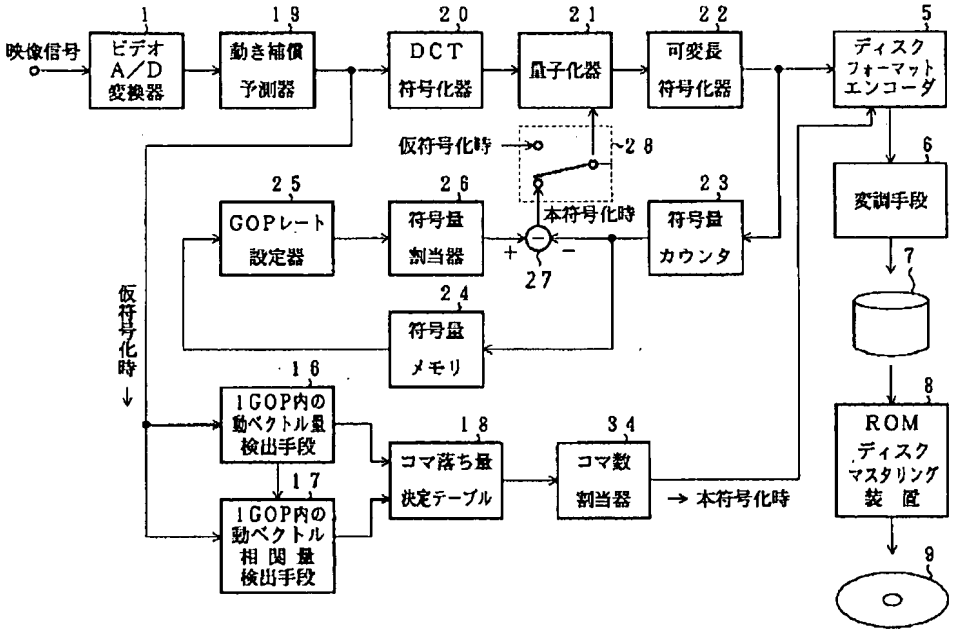
[Drawing 8]



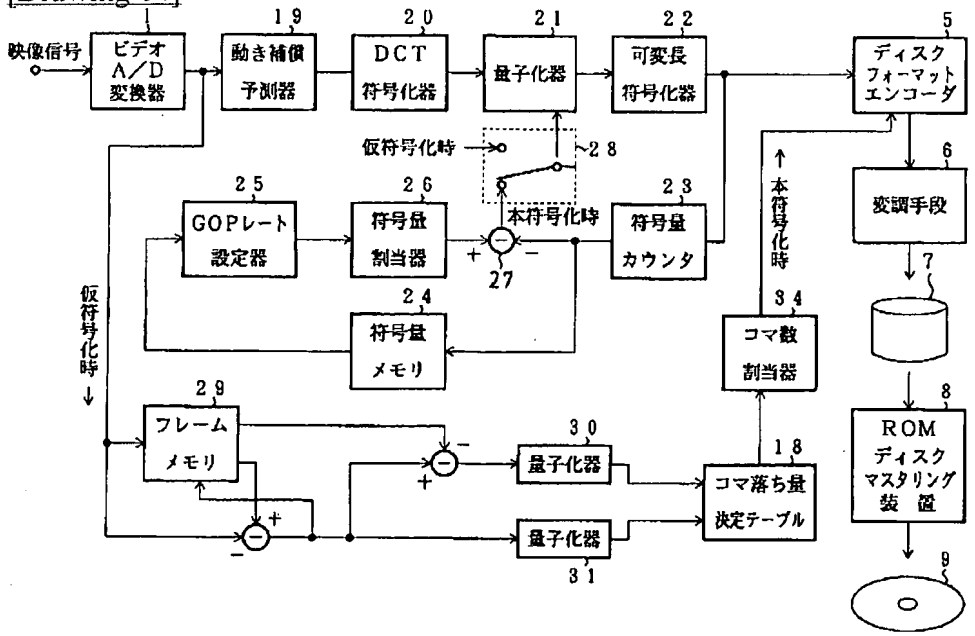
[Drawing 12]



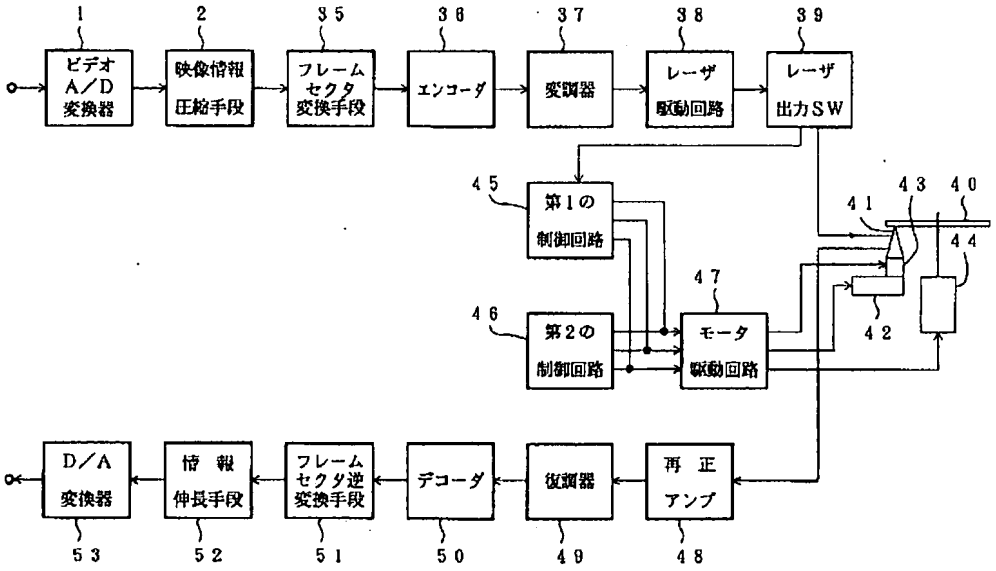
[Drawing 13]



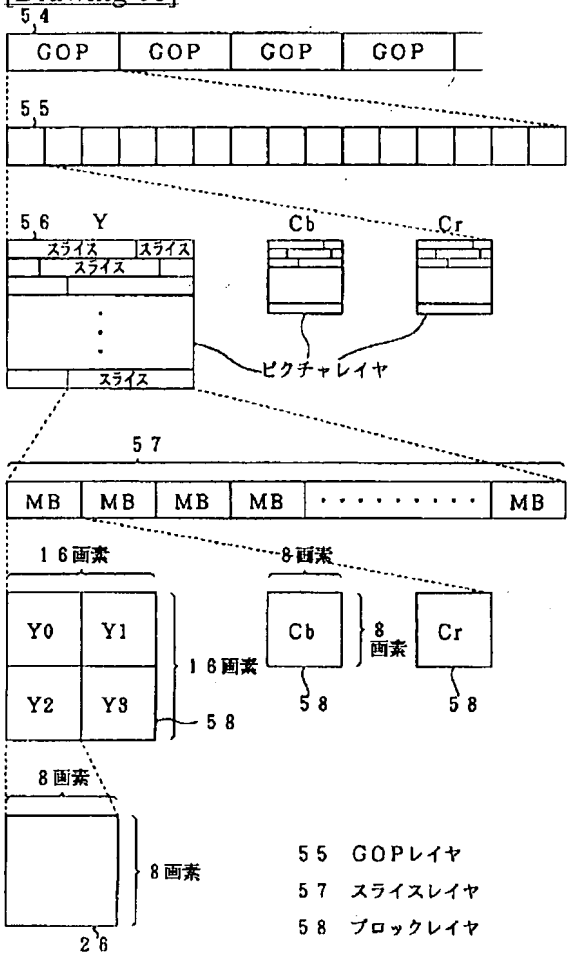
[Drawing 14]



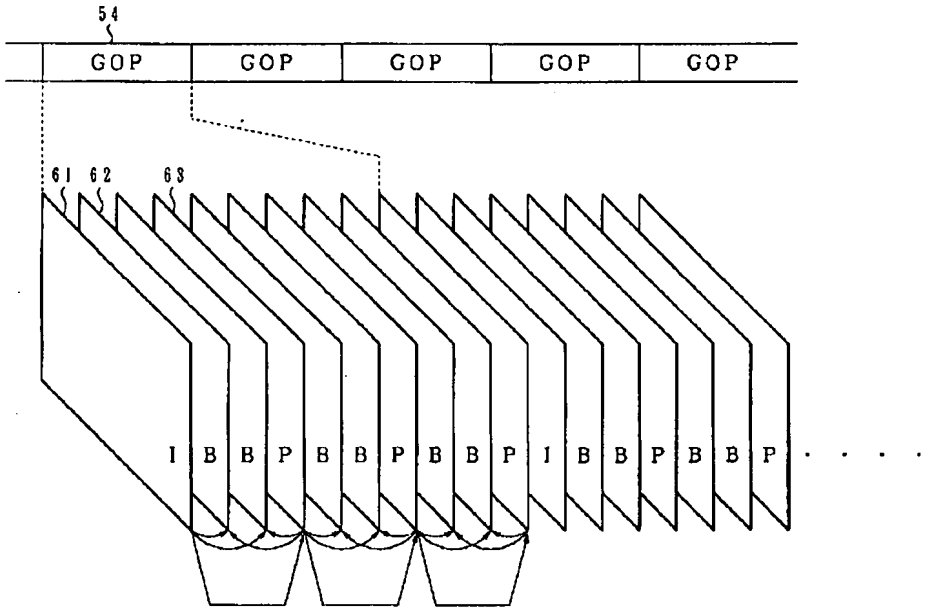
[Drawing 15]



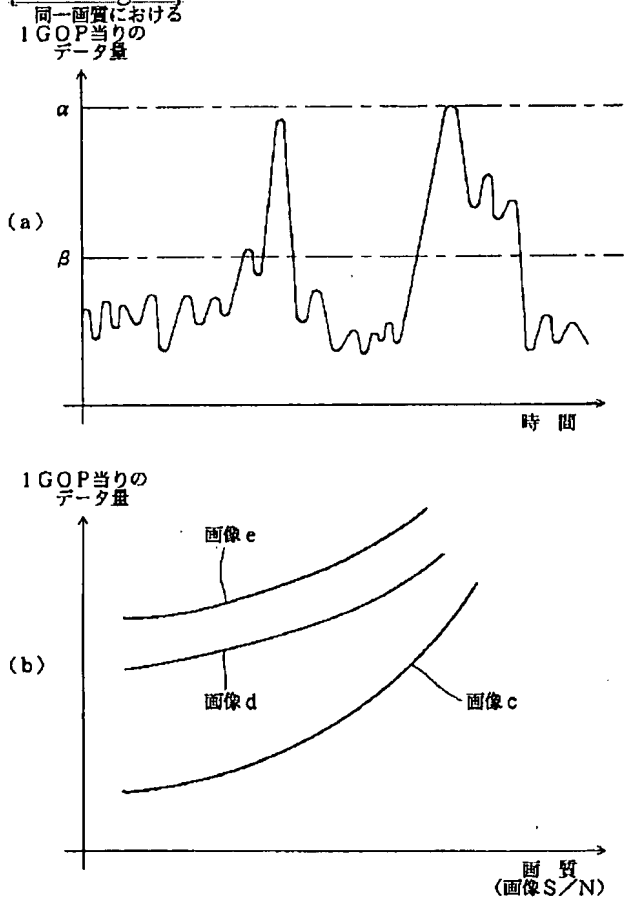
[Drawing 16]



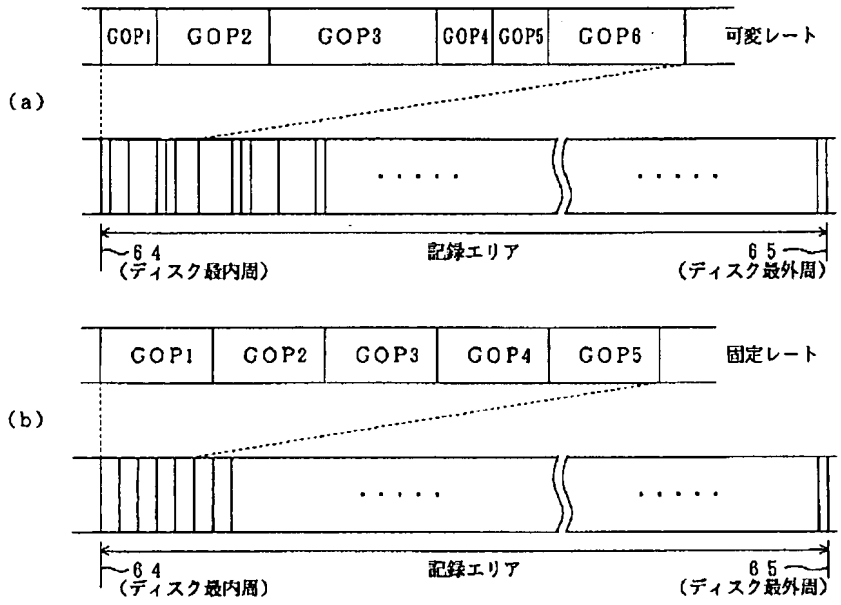
[Drawing 17]



[Drawing 19]



[Drawing 18]



[Translation done.]